

# Virtualization

## Cloud Computing

## The Next Internet

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Cloud Computing Project



# Cisco Cloud Strategy

## Build Right Products

Unified Fabric  
Unified Compute  
Virtualization Aware

## Technology

Enhanced IP core with tight coupling to Software

## Multi-Phased

Standalone Clouds  
to  
Enterprise-Class  
to  
Intercloud

## Services/ Reference SW

Services-led Cloud blueprints  
Reference software stacks

## Open Standards

Accelerate Cloud deployment  
and federation through  
Cloud standards





# Cloud Service Models

## Application

- SaaS



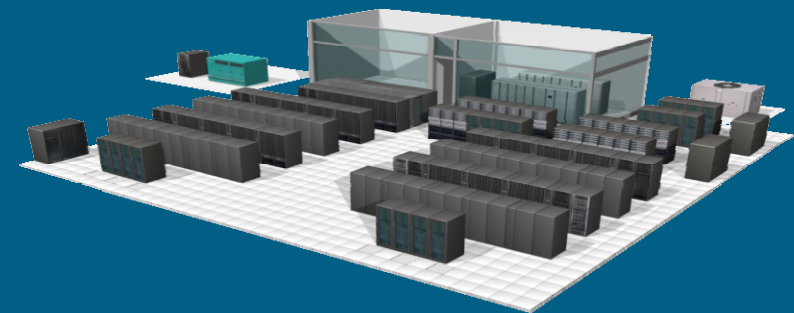
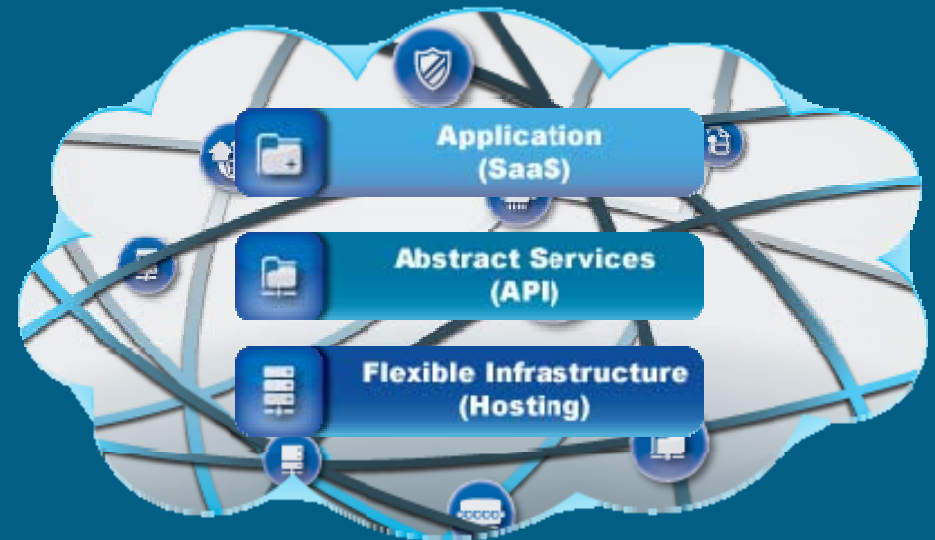
## Abstract Services

- Services and Platforms for New Applications (via new APIs)



## Flexible Infrastructure

- "Virtual Private Datacenter"
- Familiar DC Resources Delivered On-Demand



IT Foundation

# Next Wave of Application Architecture



Cloud?

Web/Internet

Minicomputer/PC  
(Client/Server)

Mainframe



1960

1970

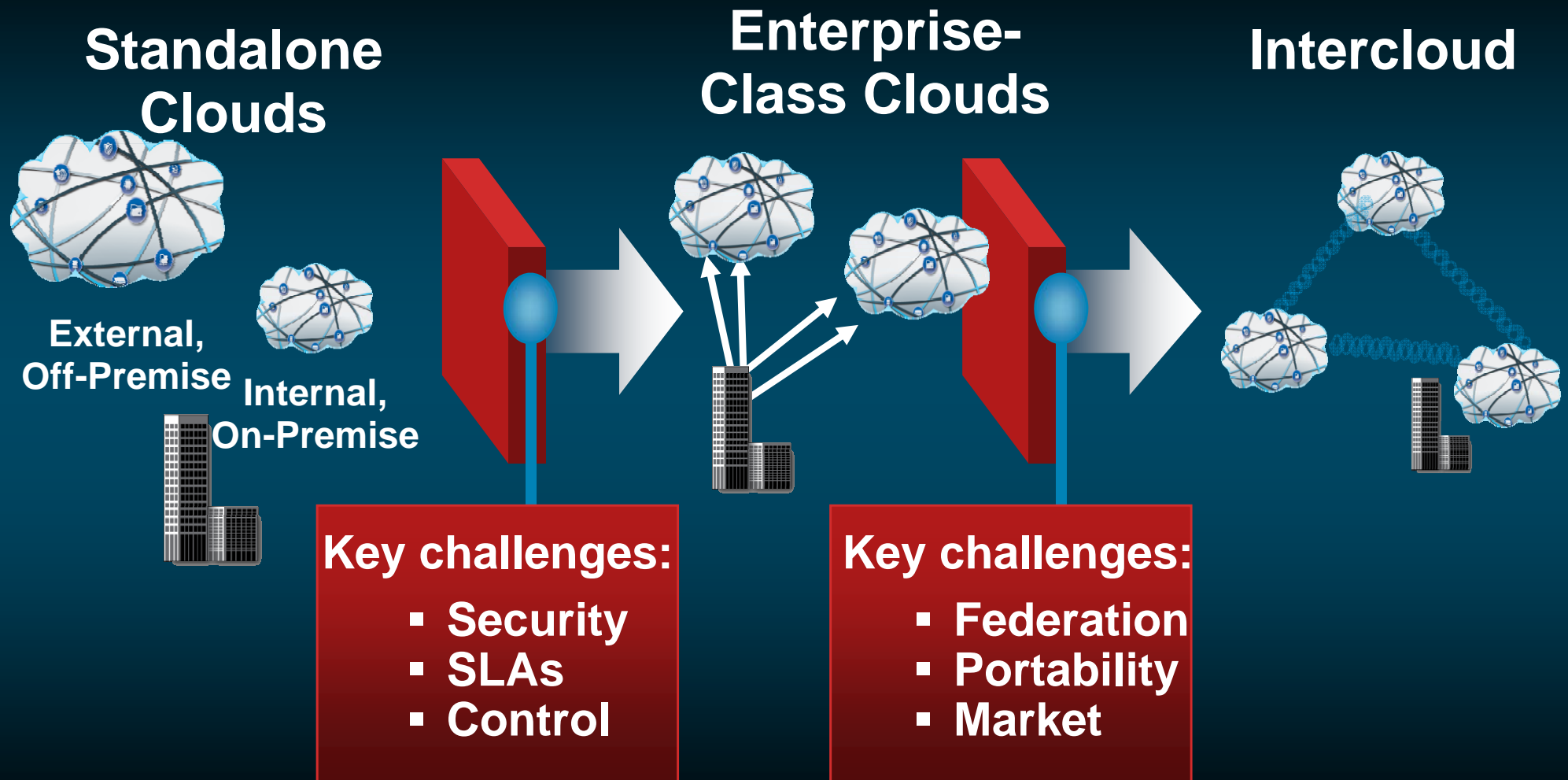
1980

1990

2000



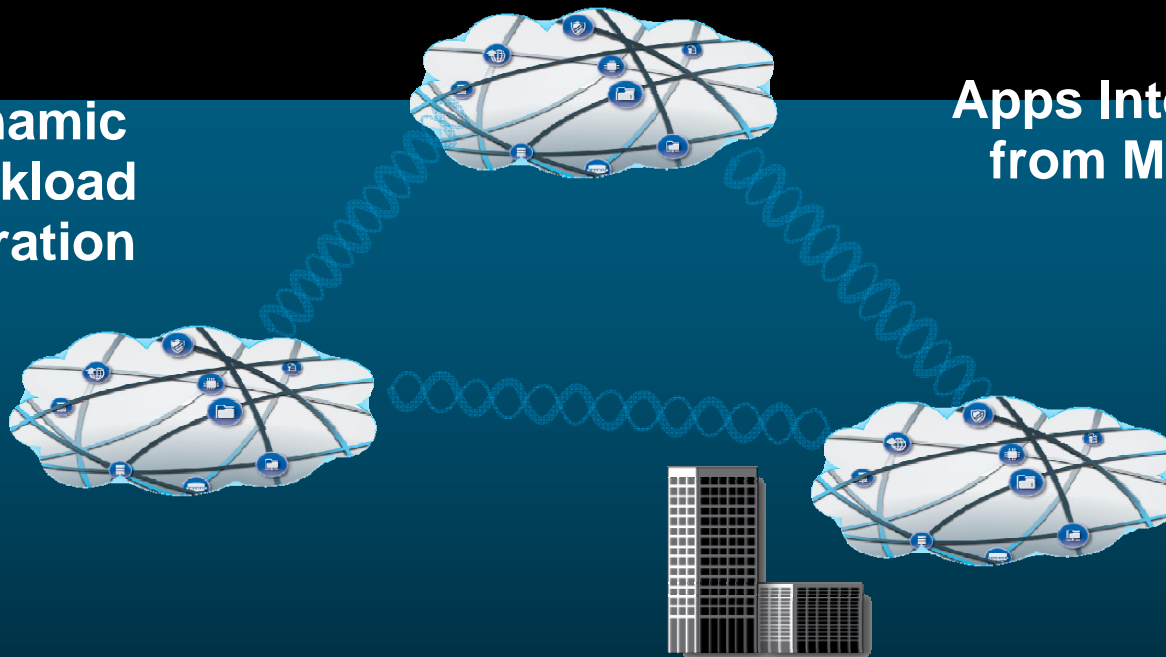
# Cloud Adoption Phases



# Vision—The Intercloud

## Flexible Infrastructure and a New Application Platform

**Dynamic  
Workload  
Migration**



**Apps Integrate Services  
from Multiple Clouds**

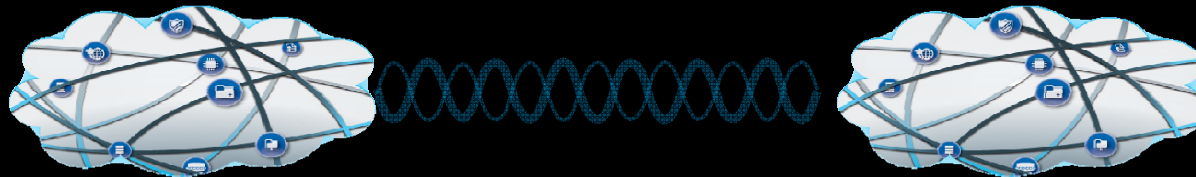
**A Federation of Clouds Based on Open Standards:**

- **Naming/Discovery**
- **Trust**
- **Exchange/Peering**



# Intercloud Example

## Dynamic Workload Migration – Simple VM Mobility



**Cloud 1 / Cloud 2 transport**  
→ **XMPP**

**Cloud 1 finds Cloud 2**  
→ **Naming, Presence**

**Cloud 1 trusts Cloud 2**  
→ **Certificates, Trustsec**

**Cloud 1/2 negotiate**  
→ **Policy, Entitlement, Security, Metering**

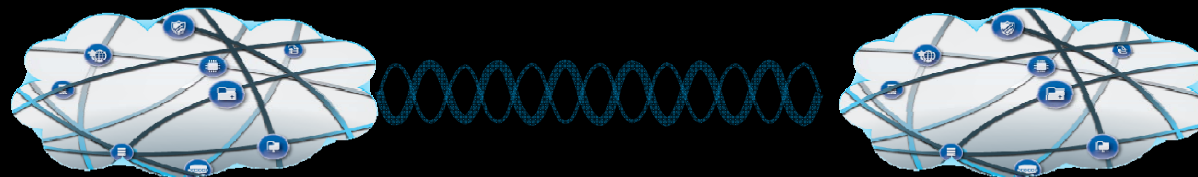
**Cloud 1 sets up Cloud 2**  
→ **Placement, Deployment, Format, Motion**

**Cloud 1 sends to Cloud 2**  
→ **Transfer, Management**

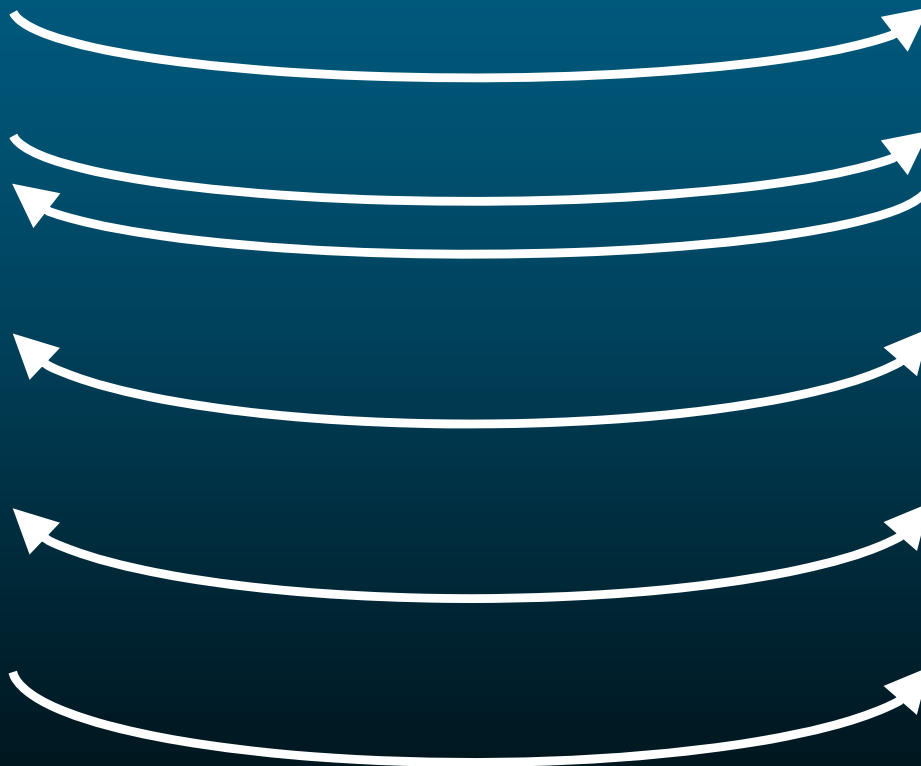
**VM Runs in Cloud 2**  
→ **Addressing, VLAN, WWN, Filesystem**

# Intercloud Example

## Dynamic Workload Federation – Generalized Service Access



Cloud 1 / Cloud 2 transport  
→ XMPP



Cloud 1 finds Cloud 2  
→ Naming, Presence

Cloud 1 trusts Cloud 2  
→ Certificates, Trustsec

Cloud 1 queries Cloud 2  
for Services  
→ RDF/SPARQL, OWL

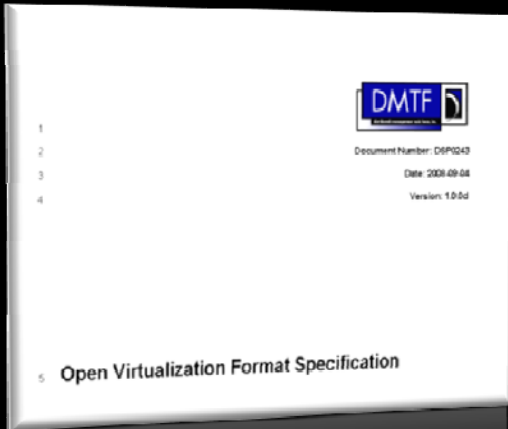
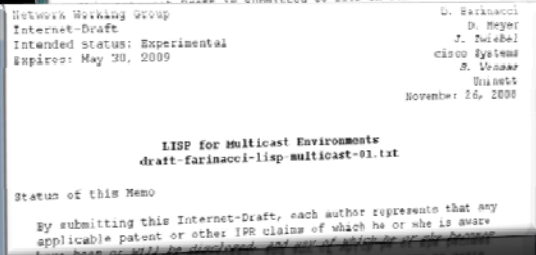
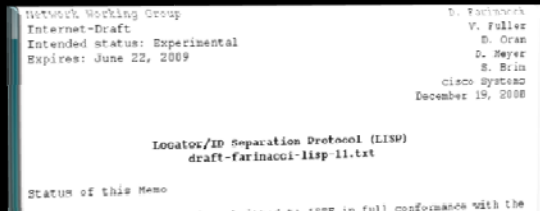
Cloud 1 selects; receives  
protocols, interface  
→ Web Services; REST API

Cloud 1 calls services in  
Cloud 2  
→ Metering, SLAs



# Specific Intercloud Projects

- Addressing – IETF LISP



- Virtual Machines - DMTF OVF



- UCI – W3C, Google Code

- Conversations – XMPP.org

```
<iq type='result'
  from='plays.shakespeare.it'
  to='romeo@montague.net/orchard'
  id='info1'>
  <query xmlns='http://jabber.org/protocol/disco#info'>
  <identity
    category='conference'
    type='text'
    name='Play-Specific Chatrooms'/>
  <identity
    category='directory'
    type='chatroom'
    name='Play-Specific Chatrooms'/>
  <feature var='http://jabber.org/protocol/disco#info'>
  <feature var='http://jabber.org/protocol/disco#info'>
  <feature var='http://jabber.org/protocol/disco#info'>
  <feature var='jabber:iq:register'>
  <feature var='jabber:iq:search'>
  <feature var='jabber:iq:time'>
  <feature var='jabber:iq:version'>
  </query>
</iq>
```



- Distributed Storage Acceleration - opencloudconsortium.org, udt.sourceforge.net

# Intercloud Standards and Protocols Roadmap

*Lots of Work to do*

SOA approach and standards will be re-used heavily

Some kind of Industry Association is inevitable





# Opencloud/Intercloud Testbed

**Open Cloud Consortium**

home    about    working groups    testbed    software    members    license

### The Open Cloud Consortium (OCC)

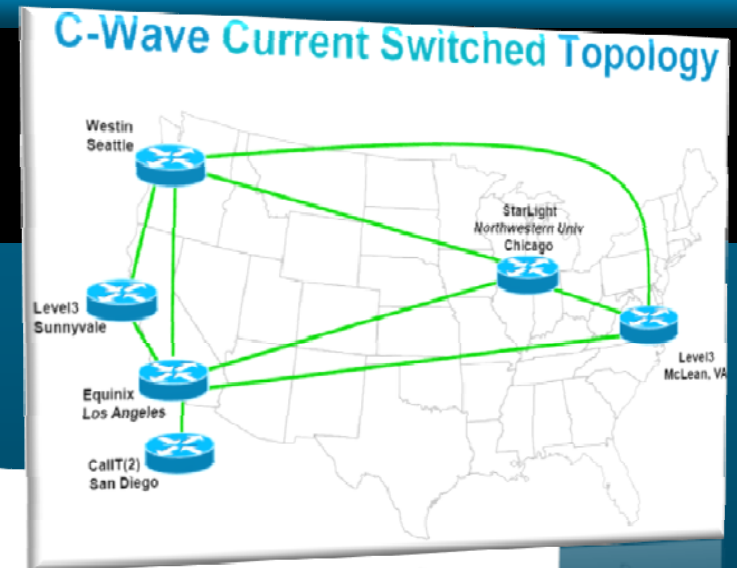
1. supports the development of standards for cloud computing and frameworks for interoperating between clouds;
2. supports the development of benchmarks for cloud computing;
3. supports open source software for cloud computing;
4. manages a testbed for cloud computing called the Open Cloud Testbed;
5. sponsors workshops and other events related to cloud computing.

The Open Cloud Consortium is organized into different [working groups](#).

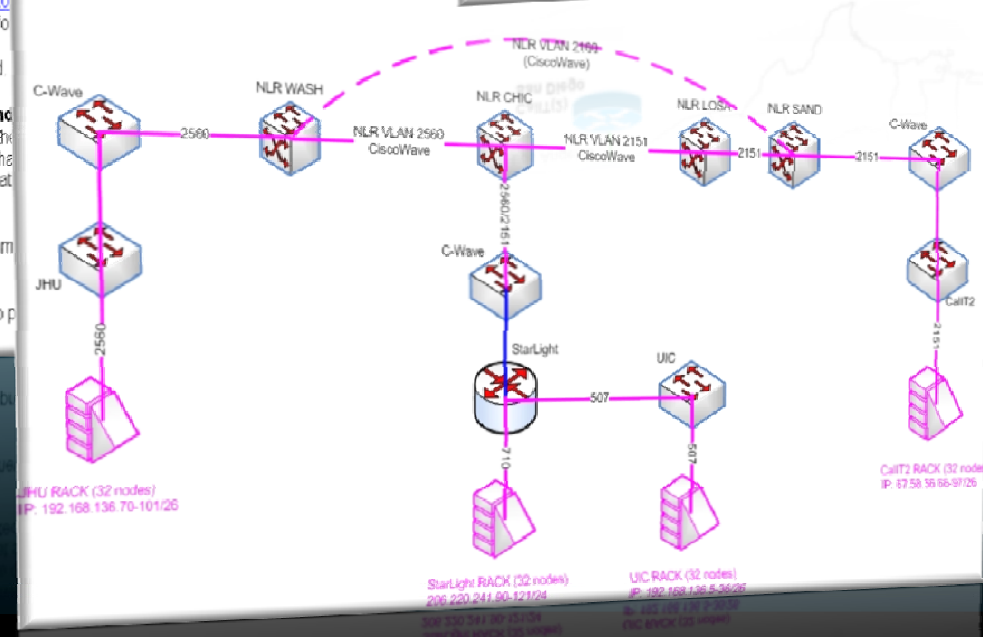
If you are interested in joining the Open Cloud Consortium, please send email to [info](#) at [opencloud](#).

### What's New

- **February 12-16, 2009, Demonstration.** The OCC will be demonstrating a version of [Sector/Sphere](#) applications at the [AAAS Meeting](#) in Chicago. This appears to be the first cloud designed for
- **January 7, 2009.** An [article](#) about the Open Cloud Consortium appeared in Network World.
- **November 20, 2008, Sector/Sphere and the Open Cloud Testbed win the SC 08 Bandwidth Challenge.** Consortium participated in an entry that consisted of several cloud applications running on the [SC 08](#) Bandwidth Challenge. This included a terasort running on the Open Cloud Testbed that sustained an average throughput of 4.8 Gb/s and a peak throughput of 10 Gb/s. Racks located in San Diego were used in the entry.
- **November 17-20, 2008, SC 08.** Several applications, benchmarks, and interoperability frameworks were demonstrated using the Open Cloud Testbed.
- **November, 2008, Thrift Interoperability Study.** A study was completed that used Thrift to connect several different cloud providers, including the Hadoop DFS and the Sector DFS.



## THE OPEN CLOUD TESTBED





**CISCO**

TM

TM